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BIOPROCESOS-TEP 138

Spatio-temporal data fusion for monitoring terrain of olive plantations in the South of Spain

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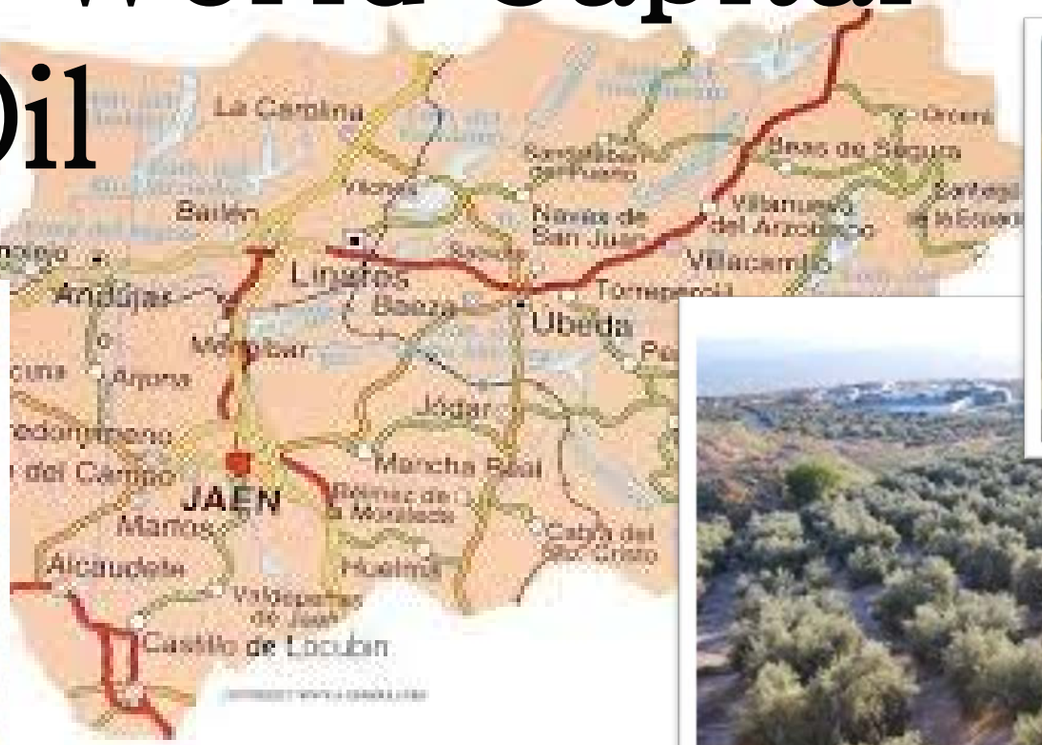
Jaén: The World Capital of Olive Oil



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The future of the CAP (Common Agricultural Policy):

https://goo.gl/ZAnL65

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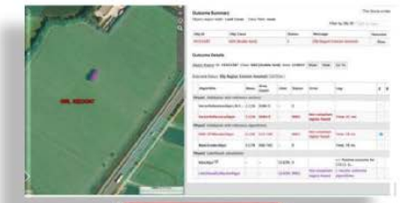
Plant-life

around the world

Technology that makes things simpler …



Pre-filled digital application

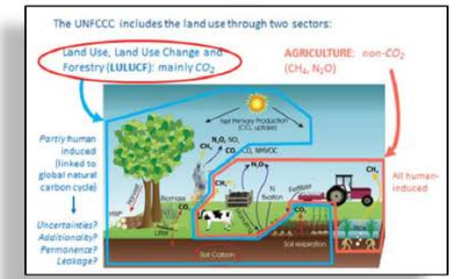
Use of:
Cloud
Automated process

Simpler for farmer

Data capture:
Geotagged/time stamped photos

Use of:
Galileo
Cloud

Simpler for farmer and administration



Interoperability allowing Automated reporting

Use of:
Big data
Automated process

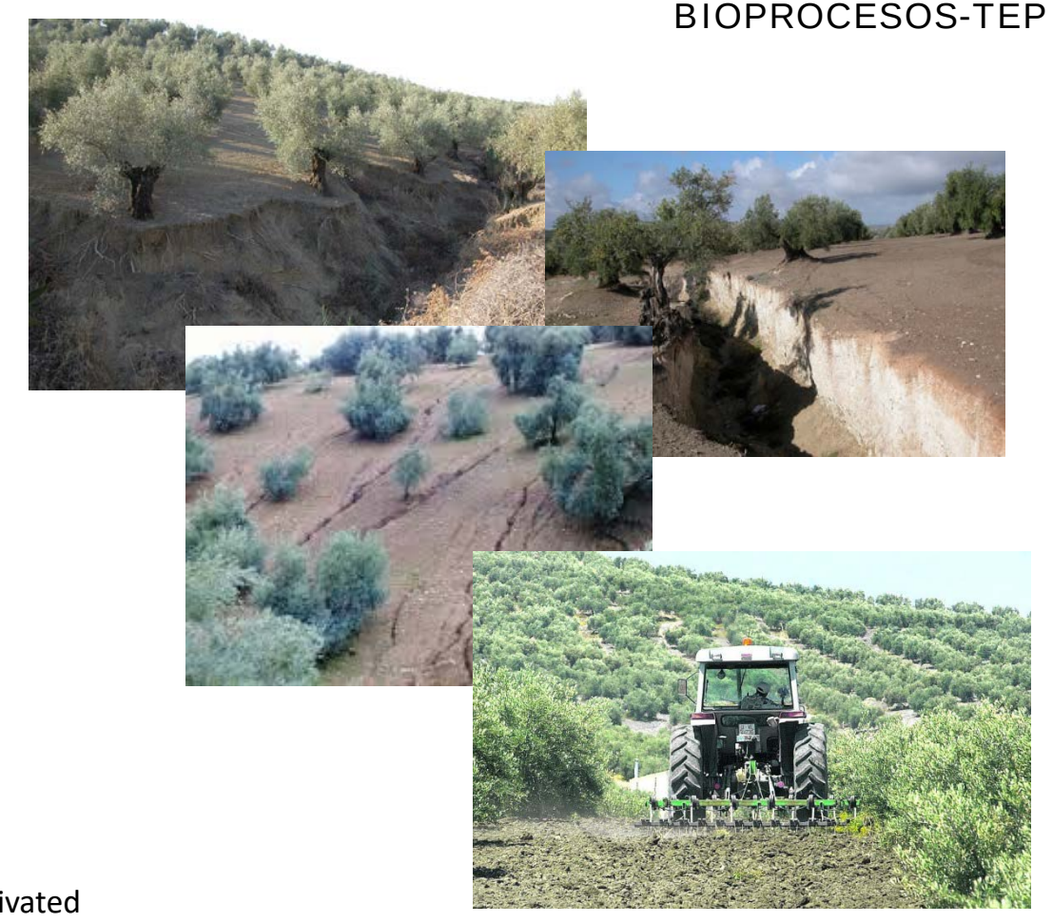
Simpler for administration

…. the problem:

EROSION: An important problem in the olive grove

The olive grove is cultivated in many occasions in propitious conditions for the erosion.

- slope areas,
- trees covering only a part of the soil,
- systems oriented traditionally to eliminate vegetation,
- an intense traffic during the harvest,
- enduring copious and intense rains from time to time,



The derivative hurts of not controlling the erosion are relevant:

In Europe estimated an average cost of 85 € year/ $ha_{cultivated}$

….analysing the problem:

Harm provoked by the erosion:

In the olive grove	Out of the olive grove
Loss of organic matter and nutrients: decrease of the depth of soil: a minor aptitude to store rain water in the soil, which is a key loss in dryness and in deficit irrigation	**Damage to courses of water or infrastructures:** Due to the nutrients and agrochemicals that contaminate the water, or to the sediment that fulfills reservoirs, ponds, ditchs, etc …
Soil with worse physical properties: The soil will tend to be compacted more, to infiltrate less water, and to be easier to drag for the run-off	**Downstream zones damage:** Due to buried areas (annual harvest), or because of erosive processes (gullies)
Difficulties of traffic: If gullies appear, it will be more difficult to maneuver in the olive grove for harvesting operations	

….identifying the problem:

Factors that determine the erosion:

1. Quantity and intensity of the rain
2. Length and inclination of the slope
3. Characteristics of the soil
4. Coverage of soil
5. Use of soil
6. Concentration of the run-off
7. Structural elements

…How to manage it?

The control of the erosion:

- improving all the factors (previous list)
- doing a regular follow-up of the evolution of the symptoms of erosion and of the properties of soil.

- In the phase of implanting, with the trees **following the level curves** or implanting **terraces**.
- After: traffic and operations in parallel sense to the level curves.

This way will achieve that the run-off circulates slower and other measures of erosion control will be more effective.

…As a strategy

Recover the vegetation in the boundaries (preferably autochthonous) trying to stop the erosive action of the wind and the water.

- Modifiying the form in which the run-off flows.
- The most recommended strategy is to **increase the coverage of the soil** in olive grove using vegetation: To avoid the competition with nearby trees.

- Our portable devices

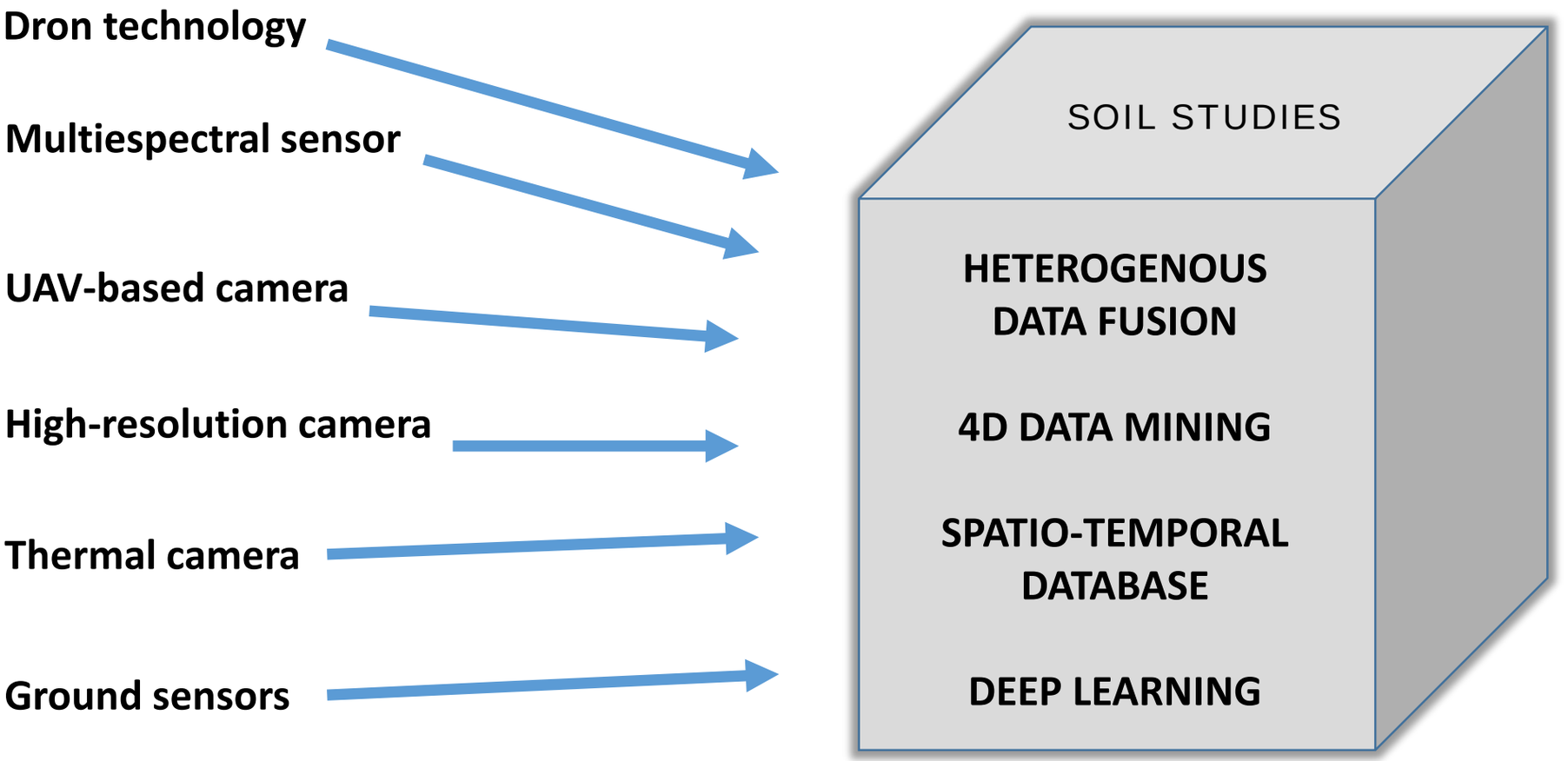
DJI Matrice 210

DJI Zenmuse X5S (20 MP)

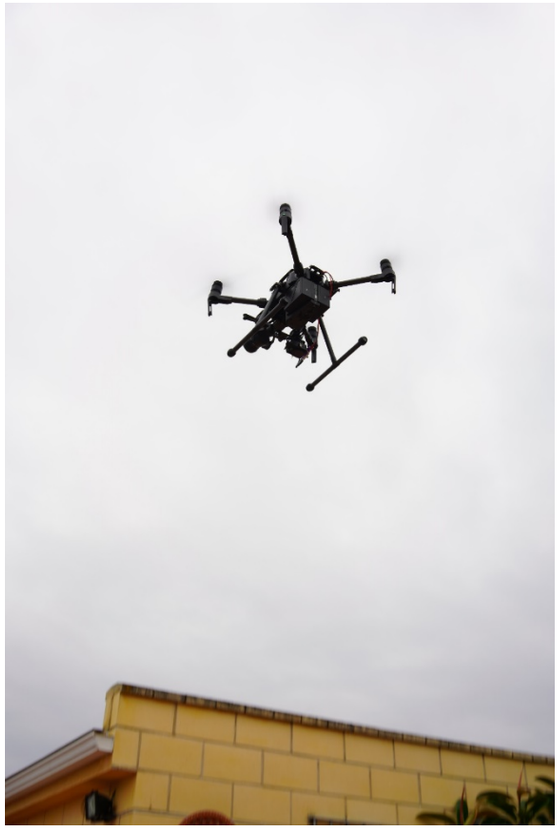
Parrot Sequoia multispectral camera

Sony Alpha 7R III (42 MP)

DJI Zenmuse XT2


Dron technology
Multiespectral sensor
UAV-based camera
High-resolution camera
Thermal camera
Ground sensors
SOIL STUDIES
HETEROGENOUS DATA FUSION
4D DATA MINING
SPATIO-TEMPORAL DATABASE
DEEP LEARNING

Our work in progress…

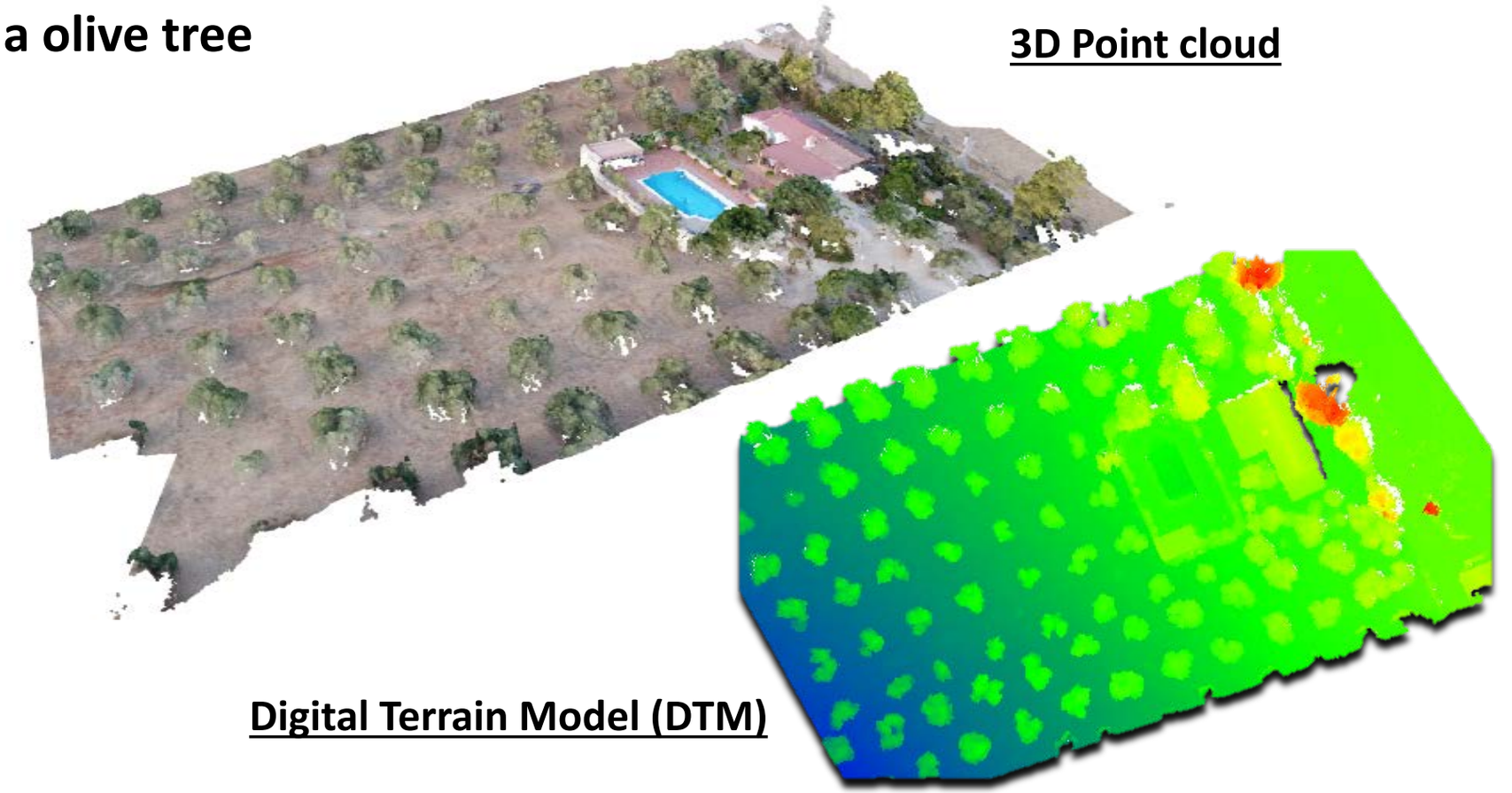


- Multispectral and high-resolution images are acquired from UAV.
- Multiple ground points are measured with a terrestrial RTK GPS.

Our work in progress…

1. 3D reconstruction of a olive tree plantation

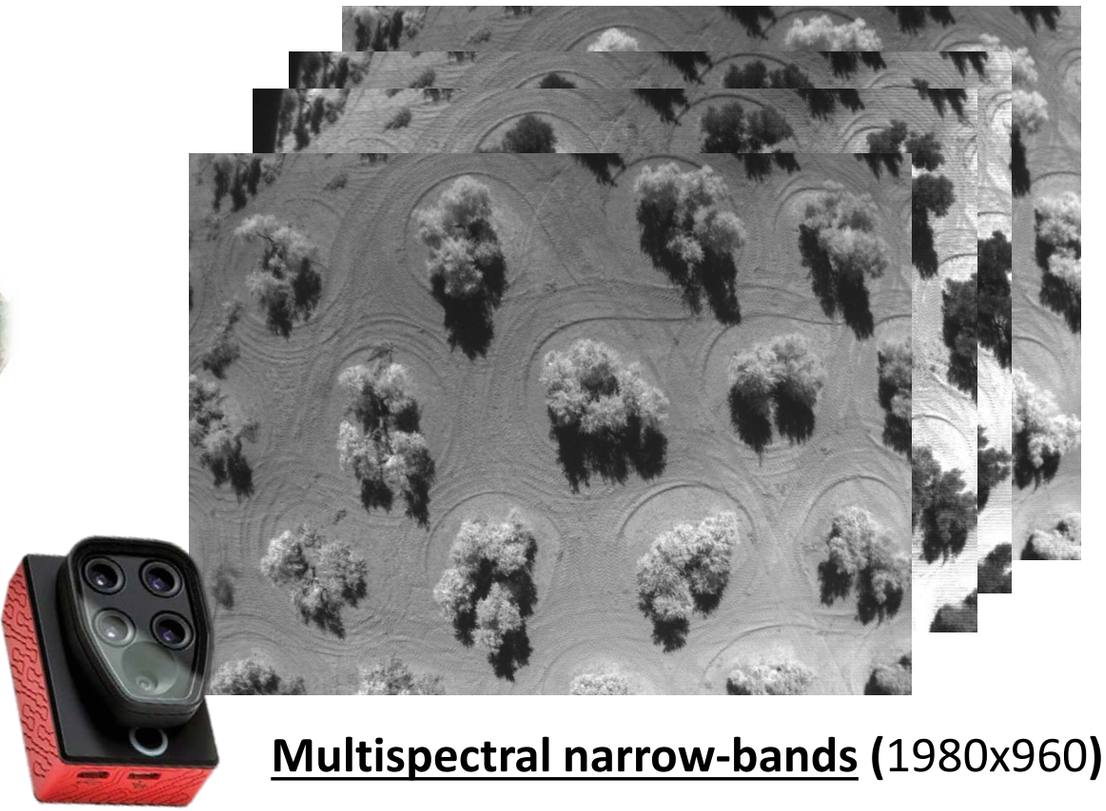
3D Point cloud



Digital Terrain Model (DTM)

2. Multispectral image mapping to the 3D point cloud

Photogrammetric 3D model



Multispectral narrow-bands (1980x960)

Our work in progress…

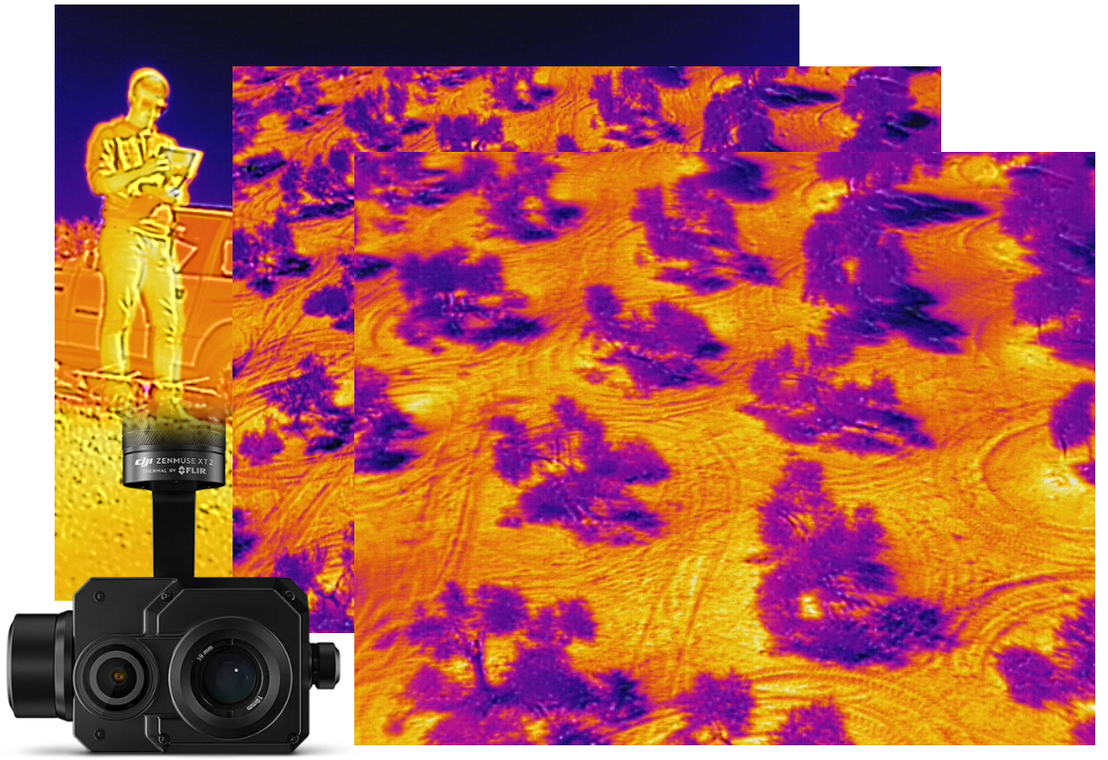
3. Dissemination of vegetation areas

Input point cloud

3D Plant segmentation

The terrain

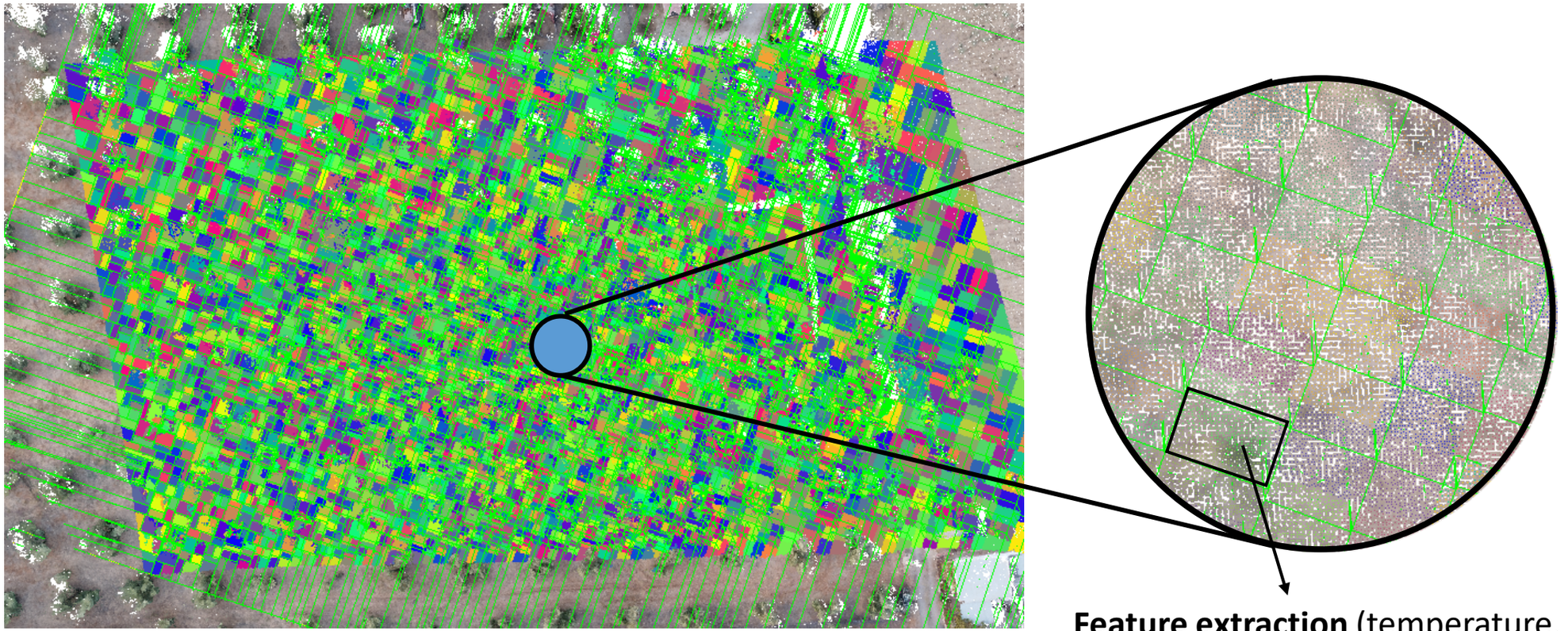
4. Fusion of thermal images and 3D ground model



Thermal images (640×512)

Photogrammetric 3D model

5. Spatial and semantic terrain subdivision



Feature extraction (temperature, humidity spectral reflectance, slope and aspect)

Main goals for the future research (next months)

1. The study of the evolution of observed features (temperature, moisture, spectral reflectance, slope and aspect).

2. The analysis of the terrain composition in the laboratory by a random selection of ground subdivisions.

3. The detection of the impact of different environmental factors, specifically the rain, and the tillage activities (fruit recollection, pruning, etc.).

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Thanks for your attention

Any questions?

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